

ANALYTICAL BIOCHEMISTRY

An International Journal of
Methods in the Biological Sciences

EDITOR-IN-CHIEF

William B. Jakoby

EXECUTIVE EDITORS

Assistant to the Editor-in-Chief, William S. Allison

Shelby L. Berger
Ludwig Brand
Peter Brodelius
Jack E. Dixon
Theodore Friedmann
Othmar Gabriel
John A. Hanover

William F. Harrington
Tony E. Hugli
Richard D. Klausner
John H. Law
Y. C. Lee
Walter M. Lovenberg
William D. McElroy
Richard N. Perham

James F. Riordan
J. Edwin Seegmiller
B. David Stollar
Clarence H. Suelter
Bert L. Vallee
Helen Van Vunakis
Arthur Weissbach

Alvin Nason, Founding Editor, 1960–1977
Nathan O. Kaplan and William D. McElroy,
Editorial Committee Co-Chairmen, 1978–1986

Volume 174, 1988



ACADEMIC PRESS, INC.

Harcourt Brace Jovanovich, Publishers

San Diego New York Boston

London Sydney Tokyo Toronto

Copyright © 1988 by Academic Press, Inc.

All Rights Reserved

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the copyright owner.

The appearance of the code at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use, or for the personal or internal use of specific clients. This consent is given on the condition, however, that the copier pay the stated per copy fee through the Copyright Clearance Center, Inc. (27 Congress Street, Salem, Massachusetts 01970), for copying beyond that permitted by Sections 107 or 108 of the U. S. Copyright Law. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. Copy fees for pre-1988 articles are as shown on the article title pages; if no fee code appears on the title page, the copy fee is the same as for current articles.

0003-2697/88 \$3.00

MADE IN THE UNITED STATES OF AMERICA

CONTENTS OF VOLUME 174

NUMBER 1, OCTOBER 1988

Review. Amino Acid Analysis Utilizing Phenylisothiocyanate Derivatives	
<i>Steven A. Cohen and Daniel J. Strydom</i>	1
Reductive Release of Ferritin Iron: A Kinetic Assay	
<i>Rodney F. Boyer, Thomas W. Grabill, and Robert M. Petrovich</i>	17
The Use of Plasma Desorption Time-of-Flight Mass Spectrometry to Screen for Products of Prohormone Processing in Crude Tissue Extracts	
<i>P. C. Andrews, Mershid Alai, and Robert J. Cotter</i>	23
A Continuous Spectrophotometric Assay for the Enzymatic Marker Glucose 6-Phosphatase	
<i>Maria Stio, Paolo Vanni, and Giancarlo Pinzauti</i>	32
Purification, Amino Terminal Analysis, and Peptide Mapping of Proteins after <i>in Situ</i> Postelectrophoretic Fluorescent Labeling	
<i>Juan C. Vera, Coralía I. Rivas, Patricia A. Cortés, Juan O. Cárcamo, and Jorge Delgado</i>	38
The Identification of Furanose and Pyranose Ring Forms of the Reducing Units of Oligosaccharides	
<i>John H. Pazur, Frank J. Miskiel, and Belin Liu</i>	46
Generation of Peptides Suitable for Sequence Analysis by Proteolytic Cleavage in Reversed-Phase High-Performance Liquid Chromatography Solvents	
<i>Karen Gjessing Welinder</i>	54
Determination of Peroxidative Halogenation in Mixtures of Chloride and Bromide	
<i>Clare L. Ritter, Theresa M. Stead, and Danuta Malejka-Giganti</i>	65
Phosphorimeters for Analysis of Decay Profiles and Real Time Monitoring of Exponential Decay and Oxygen Concentrations	
<i>Thomas J. Green, David F. Wilson, Jane M. Vanderkooi, and Stephen P. DeFeo</i>	73
Measurement of Immunoreactive Angiotensin Peptides in Rat Tissues: Some Pitfalls in Angiotensin II Analysis	
<i>Preenie E. De Silva, Ahsan Husain, Robert R. Smeby, and Philip A. Khairallah</i>	80
Apparent Ornithine Decarboxylase Activity, Measured by $^{14}\text{CO}_2$ Trapping, after Frozen Storage of Rat Tissue and Rat Tissue Supernatants	
<i>Dennis W. Gaines, Leonard Friedman, and Peter P. McCann</i>	88
Fixation Increases Sensitivity of India Ink Staining of Proteins and Peptides on Nitrocellulose Paper	
<i>K. W. Li, W. P. M. Geraerts, R. van Elk, and J. Joosse</i>	97
Time-Resolved Detection of Energy Transfer: Theory and Application to Immunoassays	
<i>Larry E. Morrison</i>	101
Low-Density Lipoprotein Preparation by Combined Diafiltration and Ultracentrifugation	
<i>K. A. Pritchard, Jr., J. A. Holland, N. J. Rogers, C. C. Crean, T. E. Britton, P. Onigman, and M. B. Stemerman</i>	121
Affinity Chromatography of Fibrinogen on <i>Lens culinaris</i> Agglutinin Immobilized on CNBr-Activated Sepharose: Study of the Active Groups Involved in Nonspecific Adsorption	
<i>Juan Carlos Tercero and Teresa Diaz-Mauriño</i>	128
Tritium Isotope Effect in High-Pressure Liquid Chromatography of Vitamin D Metabolites	
<i>Graeme K. Worth and Robert W. Retallack</i>	137
Data-Sieving Hydrophobicity Plots	
<i>J. Andrew Bangham</i>	142
Zinc Chelatase in Human Lymphocytes: Detection of the Enzymatic Defect in Erythropoietic Protoporphyrria	
<i>A. V. W. Nunn, P. Norris, J. L. M. Hawk, and T. M. Cox</i>	146

Enzyme-Linked Immunosorbent Assay (ELISA)-Based Quantification and Identification of <i>in Vitro</i> Enzyme-Catalyzed Glycosphingolipid Synthesis and Degradation Products with Carbohydrate Sequence-Specific Monoclonal Antibodies	<i>Cheryl L. M. Stults, Bruce J. Wilbur, and Bruce A. Macher</i>	151
Sodium Dodecyl Sulfate-Gel Electrophoresis: Staining of Polypeptides Using Heavy Metal Salts	<i>James K. Dzandu, John F. Johnson, and Gary E. Wise</i>	157
Fluorometric Assay of DNA in Cartilage Explants Using Hoechst 33258	<i>Young-Jo Kim, Robert L. Y. Sah, Joe-Yuan H. Doong, and Alan J. Grodzinsky</i>	168
Measurement of the Affinities of Heparins, Naturally Occurring Glycosaminoglycans, and Other Sulfated Polymers for Antithrombin III and Thrombin	<i>Joan Dawes</i>	177
Measurement of Microgram Quantities of Protein by a Generally Applicable Turbidimetric Procedure	<i>Juan C. Vera</i>	187
Prevention of Aggregation of Synthetic Membrane-Spanning Petides by Addition of Detergent	<i>John M. Tomich, L. Wulf Carson, Katherine J. Kanen, Nancy J. Vogelaar, Michael R. Emerling, and John H. Richards</i>	197
Detection of Cellulose-Binding Proteins in Electrophoresis Gels by Filter Paper Affinity Blotting	<i>Larry Montgomery and Yung-Kang Fu</i>	204
A Quantitative Method for Analyzing Specific DNA Sequences Directly from Whole Cells	<i>Peter McIntyre and George R. Stark</i>	209
Use of Reverse Transcription to Determine the Exact Locations of Psoralen Photochemical Crosslinks in RNA	<i>Gwen Ericson and Paul Wollenzien</i>	215
Solid-Phase Peptide Quantitation Assay Using Labeled Monoclonal Antibody and Glutaraldehyde Fixation	<i>Philip G. Kasprzyk, Frank Cuttitta, Ingalill Avis, Yoichi Nakanishi, Anthony Treston, Helen Wong, John H. Walsh, and James L. Mulshine</i>	224
Specific Protein-DNA Complexes: Immunodetection of the Protein Component after Gel Electrophoresis and Western Blotting	<i>Michèle Granger-Schnarr, Roland Lloubes, Gilbert de Murcia, and Manfred Schnarr</i>	235
Labeling Methods for the Study of Poly- and Mono(ADP-ribose) Metabolism in Cultured Cells	<i>Nasreen Aboul-Ela, Elaine L. Jacobson, and Myron K. Jacobson</i>	239
Differential Refractometric Determination of Binding of Sodium Dodecyl Sulfate to Protein Using High-Performance Gel Chromatography	<i>Ping-Fan Rao and Toshio Takagi</i>	251
Automation of Data Acquisition and Processing in Assays for Anchorage-Independent Growth: Application to the Purification of Epithelial Transforming Growth Factor	<i>Damien J. Dunnington, Seth Pinsky, Don Mattes, William Prichett, Craig Q. Earl, Russell Greig, and Mario A. Anzano</i>	257
Dithiothreitol and Amino Acids Interfere with the Fluorometric Determination of Glutathione with Orthophthaldehyde	<i>Russell C. Scaduto, Jr.</i>	265
Periodate-Methylamine Degradation of Ribonucleotides in Rat Liver Extracts in Comparison to Extracts of Cultured Cells	<i>Marianne Andersson</i>	271
Separation and <i>o</i> -Phthaldehyde Fluorometric Determination of 5-Hydroxy- and 5-Methoxyindoleamines by Thin-Layer Chromatography: Selected Applications	<i>J. M^a Arqué, J. Serrano, A. de Leiva, and R. Segura</i>	275
Analysis of Ligand-Binding Data without Knowledge of Bound or Free Ligand Molar Concentration	<i>Bernard Le Bonniec, Jacques Sauloy, Rolande Ducrocq, and Jacques Elion</i>	280

Continuous Spectrophotometric Assays for Cytosolic Epoxide Hydrolase	Roger N. Wixtrom and Bruce D. Hammock	291
A Solid-Phase Immunosorbent Assay for the Detection of Protein Kinase-Specific Monoclonal Antibodies	Martin Hochstrasser and David L. Nelson	300
Enzyme Immunoassay Using Monoclonal Antibodies to Study Conformational Changes of Human Serum Albumin	Claude Lapresle	308
Detection and Use of Recombinant Staphylococcal Protein A Fusion Proteins to Localize Nucleic-Acid-Binding Domains of Proteins	Chi V. Dang	313
AraUTP-Affi-Gel 10: A Novel Affinity Adsorbent for the Specific Purification of DNA Polymerase α -Primase	Shunji Izuta and Mineo Saneyoshi	318
Determination of Brush Border Membrane Vesicle Orientation Using Monoclonal Antibodies Recognizing Extracytoplasmic and Cytoplasmic Domains of Neutral Endopeptidase-24.11	Catherine Vénien, Muriel Aubry, Philippe Crine, and Christian Le Grimellec	325
A Spectrophotometric Method for Determination of Catalase Activity in Small Tissue Samples	Lars H. Johansson and Borg L. A. Håkan	331
Mixed Anionic Detergent/Aliphatic Alcohol-Polyacrylamide Gel Electrophoresis Alters the Separation of Proteins Relative to Conventional Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis	Earl G. Brown	337
Quantification of Quinolinic Acid in Rat Brain, Whole Blood, and Plasma by Gas Chromatography and Negative Chemical Ionization Mass Spectrometry: Effects of Systemic L-Tryptophan Administration on Brain and Blood Quinolinic Acid Concentrations	Melvyn P. Heyes and Sanford P. Markey	349

ERRATUM

Volume 145, Number 2, March 1985: Shawn W. O'Driscoll, Robert B. Salter, and Fred W. Keeley, "A Method for Quantitative Analysis of Ratios of Types I and II Collagen in Small Samples of Articular Cartilage," pp. 277-285	360
---	-----

NUMBER 2, NOVEMBER 1, 1988

Review. Electroporation in Biology: Methods, Applications, and Instrumentation	Huntington Potter	361
Microbial Synthesis of L-[^{15}N]Leucine L-[^{15}N]Isoleucine, and L-[3- ^{13}C]- and L-[3'- ^{13}C]-Isoleucines Studied by Nuclear Magnetic Resonance and Gas Chromatography-Mass Spectrometry	Zvi E. Kahana, Asher Gopher, Malka Dorsman, and Aviva Lapidot	374
High-Performance Liquid Chromatographic Analysis of ^{32}P -Postlabeled DNA-Aromatic Carcinogen Adducts	Gerald N. Levy and Wendell W. Weber	381
The Orientation of DNA Fragments in the Agarose Gels	Julian Borejdo and Kathryn DeFea	393
Mass Spectrometric Evaluation of Synthetic Peptides for Deletions and Insertions	R. B. Merrifield, James Singer, and Brian T. Chait	399
A Technique for Monitoring Mammalian Cell Growth and Inhibition <i>in Situ</i> via Fourier Transform Infrared Spectroscopy	Timothy B. Hutson, Melody L. Mitchell, Joseph T. Keller, David J. Long, and Ming J. W. Chang	415

A New Method of Sequencing DNA	<i>Edward David Hyman</i>	423
EZ-FIT: A Practical Curve-Fitting Microcomputer Program for the Analysis of Enzyme Kinetic Data on IBM-PC Compatible Computers	<i>Frank W. Perrella</i>	437
Enzyme-Linked Immunosorbent Assay for Hyaluronate Using Cartilage Proteoglycan and an Antibody to Keratan Sulfate	<i>Ronald L. Goldberg</i>	448
High-Performance Anion-Exchange Chromatography of Oligosaccharides Using Pellar Resins and Pulsed Amperometric Detection	<i>R. Reid Townsend, Mark R. Hardy, Ole Hindsgaul, and Yuan Chuan Lee</i>	459
Multiple Uses of Liquepipets in Southern, Northern, and Western Blots	<i>Joseph K. K. Li, Todd M. Johnson, and Bruce D. Parker</i>	471
Fluorophore-Labeled Ether Lipids: Substrates for Enzymes of the Platelet-Activating Factor Cycle in Peritoneal Polymorphonuclear Leukocytes	<i>Peter W. Schindler, Roland Walter, and H. Stewart Hendrickson</i>	477
A Simple Method for DNA Purification from Peripheral Blood	<i>Thomas A. Ciulla, Robert M. Sklar, and Stephen L. Hauser</i>	485
Determination of Glutathione in Biological Material by Flow-Injection Analysis Using an Enzymatic Recycling Reaction	<i>F. A. M. Redegeld, M. A. J. van Opstal, E. Houdkamp, and W. P. van Bennekom</i>	489
Preparation of Human Cord Sera for Enzymatic Triglyceride Assays: Removal of Free Glycerol by Ultrafiltration	<i>Ilyas M. Khan, Jason J. Schwartz, Deborah Woo, and Raymond E. Garcia</i>	496
Detection and Quantitation of Proteoglycans Extracted from Cell Culture Medium and Cultured Cartilage Slices	<i>Lucjan J. Hronowski and Tassos P. Anastassiades</i>	501
Determination of Malonaldehyde in Oxidized Lipids by the Hantzsch Fluorometric Method	<i>Kiyomi Kikugawa, Tetsuta Kato, and Atsushi Iwata</i>	512
An Automated Alkaline Elution System: DNA Damage Induced by 1,2-Dibromo-3-chloropropane <i>in Vivo</i> and <i>in Vitro</i>	<i>Gunnar Brunborg, Jørn A. Holme, Erik J. Søderlund, James G. Omichinski, and Erik Dybing</i>	522
Identification of Phosphorylation Sites in Peptides Using a Gas-Phase Sequencer	<i>Yuhuan Wang, Carol J. Fiol, Anna A. DePaoli-Roach, Alexander W. Bell, Mark A. Hermodson, and Peter J. Roach</i>	537
Separation of Lipid-Free Egg Yolk Proteins by High-Pressure Liquid Chromatography Using Solvents Containing Formic Acid	<i>D. D. Sheumack and R. W. Burley</i>	548
Isolation of Plasma Membranes from Cultured Glioma Cells and Application to Evaluation of Membrane Sphingomyelin Turnover	<i>Harold W. Cook, Frederick B. St. C. Palmer, David M. Byers, and Matthew W. Spence</i>	552
A Small Scale Procedure for the Isolation of Transport Competent Vesicles from Plant Tissues	<i>John L. Giannini, Jose Ruiz-Cristin, and Donald P. Briskin</i>	561
Micromethods in Single Muscle Fibers. 1. Determination of Catalase and Superoxide Dismutase	<i>Lawrence Austin, Helen Arthur, Michael de Niese, Asitha Gurusinghe, and Mark S. Baker</i>	568
Micromethods in Single Muscle Fibers. 2. Determination of Glutathione Reductase and Glutathione Peroxidase	<i>Lawrence Austin, Helen Arthur, Michael de Niese, Asitha Gurusinghe, and Mark S. Baker</i>	575
Quantitative Stereochemical Analysis of Subnanogram Amounts of 12-Hydroxy-(5,8,10,14)-eicosatetraenoic Acid by Sequential Chiral Phase Liquid Chromatography and Stable Isotope Dilution Mass Spectrometry	<i>John Turk, W. Thomas Stump, Bryan A. Wolf, Richard A. Easom, and Michael L. McDaniel</i>	580

Silver Stain for Proteins in Ultrathin Polyacrylamide Gels: A Sensitive Precipitation Technique	<i>H. Kling, G. Sawatzki, and W. Geis</i>	589
Electrophoretic Properties of Human IgG and Its Subclasses on Sodium Dodecyl-Sulfate-Polyacrylamide Gel Electrophoresis and Immunoblots	<i>Stephan Fasler, F. Skvaril, and Hans U. Lutz</i>	593
Identification of Microinjected Cells Using Biotinylated Antibodies and Strep-avidin-Conjugated Horseradish Peroxidase	<i>Karl T. Riabowol</i>	601
An Activity Stain for Proteins Containing Noncovalently Bound Flavin Adenine Dinucleotide	<i>Jeffrey W. Kitzler and Irwin Fridovich</i>	613
Oligonucleotide-Directed Mutagenesis: A Sequence-Based Screening	<i>Angela Duilio, Filiberto Cimino, and Tommaso Russo</i>	618
Quantitative HPLC Analysis of Acidic Opines by Phenylthiocarbamyl Derivatization	<i>M. Sato, S. Suzuki, Y. Yasuda, H. Kawauchi, N. Kanno, and Y. Sato</i>	623
Column Chromatographic Separation of Cells Using Aqueous Polymeric Two-Phase Systems	<i>David R. Skuse, Werner Müller, and Donald E. Brooks</i>	628
DESIGN: Computerized Optimization of Experimental Design for Estimating K_d and B_{max} in Ligand Binding Experiments. I. Homologous and Heterologous Binding to One or Two Classes of Sites	<i>G. Enrico Rovati, David Rodbard, and Peter J. Munson</i>	636
A Method for RNA Isolation from Marine Macro-Algae	<i>Xing Su and Aharon Gibor</i>	650
Rapid Isolation of Total RNA from Mammalian Tissues	<i>Mark Emmett and Barbara Petrack</i>	658
Dot-Blot Assays and Their Use as a Direct Antigen-Binding Method to Screen Monoclonal Antibodies to 1,4- β - and 1,3- β -Glucan Synthases	<i>Patrice Nodet, Jacques Grange, and Michel Fevre</i>	662
An Ammonia-Sensing Air Gap Microelectrode	<i>Yilong Ma and Lars Cleemann</i>	666
Use of Actin-Bound Adenosine 5'-Diphosphate as a Method to Determine the Specific ^{32}P -Radioactivity of the γ -Phosphoryl Group of Adenosine 5'-Triphosphate in a Highly Compartmentalized Cell, the Platelet	<i>Adrie J. M. Verhoeven, Carol A. Cook, and Holm Holmsen</i>	672
A Micromethod for the Determination of Carboxyl-Terminal Amino Acids of Peptides and Proteins: Phenylisothiocyanate Reaction with Hydrazinolysates	<i>Daniel J. Strydom</i>	679
An Enzyme Immunoassay for the Quantitation of Rat Liver Carbamoyl-Phosphate Synthetase I	<i>M. Cerda, A. Jorda, T. Barber, J. V. Castell, J. Cabo, and J. Timoneda</i>	687
Stokes Radius Determination of Radioiodinated Polypeptide Hormones by Gel Filtration	<i>Maria Teresa C. P. Ribela and Paolo Bartolini</i>	693
Time-Resolved Spectroscopy of Hemoglobin and Myoglobin in Resting and Ischemic Muscle	<i>Britton Chance, Shoko Nioka, Jane Kent, Kevin McCully, Michael Fountain, Robert Greenfeld, and Gary Holtom</i>	698

BOOK REVIEWS

<i>Cell Culture and Somatic Cell Genetics of Plants</i> , Vol. 4, <i>Cell Culture in Phytochemistry</i> , Edited by Friederich Constabel and Indra K. Vasil	Reviewed by <i>Arthur Weissbach</i>	708
---	-------------------------------------	-----

<i>Methods in Enzymology</i> , Vols. 146 and 147, <i>Peptide Growth Factors</i> , Parts A and B, Edited by David Barnes and David A. Sirbasku	Reviewed by <i>Gordon Guroff</i>	708
<i>Methods in Enzymology</i> , Vol. 150, <i>Immunochemical Techniques</i> , Part K, <i>In Vitro</i> <i>Models of B and T Cell Functions and Lymphoid Cell Receptors</i> , Edited by Gio- vanni Di Sabato	Reviewed by <i>David Segal</i>	709

AUTHOR INDEX FOR VOLUME 174

710

The Subject Index for Volume 174 will appear in the December 1988 issue as part of a cumulative index for the year 1988.

INFORMATION FOR AUTHORS

Analytical Biochemistry is an international journal that publishes original articles on methods and methodology of interest to the biological sciences and all fields that impinge on biochemical investigation. In addition to the expected techniques that apply to biochemical preparations and analysis, the following should be considered as within the scope of the journal:

- Cell biology and cell, tissue, and organ culture methods that are of general application.
- Membranes and membrane proteins. These methods form a major section of interest.
- Procedures of interest in the field of molecular genetics including those necessary for cloning, sequencing, and synthesis of nucleic acids and for mutagenesis.
- Purification of enzymes and other proteins, but only if the methods are both novel and applicable generally, i.e., the interest is in a means of purification rather than in the protein that is being purified.
- Immunological techniques both analytical and preparative, if they are of general applicability by biochemists. Immunoassays are included but only if a unique approach is introduced rather than the determination of a substance not previously assayable.
- Pharmacological and toxicological research techniques that offer a biochemical approach.
- Review articles dealing with timely topics. Although these are generally invited, unsolicited outlines or manuscripts will be considered.

Manuscripts are accepted for review with the understanding that the same work has not been and will not be nor is presently submitted elsewhere, and that its submission for publication has been approved by all of the authors and by the institution where the work was carried out; further, that any person cited as a source of personal communications has approved such citation. Written authorization may be required at the Editor's discretion. Articles and any other material published in *Analytical Biochemistry* represent the opinions of the author(s) and should not be construed to reflect the opinions of the Editor(s) and the Publisher.

Authors submitting a manuscript do so on the understanding that if it is accepted for publication, copyright in the article, including the right to reproduce the article in all forms and media, shall be assigned exclusively to the Publisher. The Publisher will not refuse any reasonable request by the author for permission to reproduce any of his or her contributions to the journal.

Address. Manuscripts should be submitted in quadruplicate to *Analytical Biochemistry*, Editorial Office, Seventh Floor, 1250 Sixth Avenue, San Diego, California 92101. In the case of rejected manuscripts, only one copy of the manuscript will be returned to the author.

An extended Information for Authors is published in each July issue. Reprints are available from the Editorial Office. Authors should consult this Information for details on nomenclature, IUPAC-IUB rules and recommendations, and accepted abbreviations.

Manuscripts should be concise and consistent in style, spelling, and use of abbreviations. In order to facilitate the processing of manuscripts, the journal requests that at least four copies be submitted, each copy to include all figures (originals or glossy prints) and tables. The original copy must be typewritten, double-spaced, on one side of white bond paper, about $8\frac{1}{2} \times 11$ inches in size, with one-inch margins on all sides. Each manuscript should have a separate title page noting title of article, authors' names (without degrees), a running title (not exceeding 55 letters and spaces), an abstract (250 words), the address to which proof should be mailed, and the corresponding author's telephone number and fax or telex number. In creating a title for your paper, please omit words such as *novel*, *rapid*, *improved*, *simple*, *sensitive*, *efficient*, *convenient*, *new*. Each is felt to be redundant and actually slows down the reader who is scanning the article titles and wants to know more about the method itself. Please substitute informative words that will give readers a more complete idea of the usefulness of your paper with regard to the limitations of their equipment or sample type. For example, what *kind* of method are you describing? Abbreviations should not be used in the article title or running title.

Please number all pages of the manuscript.

Authors should indicate the following on the title page: (1) the appropriate subject category for listing in the Table of Contents; (2) six descriptive key words for computer-aided selection of reviewers. (Please see the Appendix at the end of the extended Instructions to Authors published in each July issue for a list of recommended key words.) These words will also be used in the preparation of the annual cumulative subject index for the journal.

Text. The suggested organization of an article is: abstract; introductory statement; Materials and Methods; Results; Discussion; Acknowledgments; References. Some of these sections may be combined if the presentation is thereby made clearer or more effective. Although this is the general form, the journal will accept short papers of approximately two printed pages that are arranged without specific sections except for a short abstract.

Names of chemical or organic substances should follow the recommendations of the IUPAC-IUB Combined Commission on Biochemical Nomenclature (CBN) as published in the extended Instructions for Authors, appearing in the July issue of this journal.

Authors should draw attention to any particular chemical or biological hazards that may be involved in carrying out the experiments described. Any relevant safety precautions should be

described; if an accepted code of practice has been followed, a reference to the relevant standards should be given.

Figures should be numbered consecutively with Arabic numerals in order of mention in the text: each figure should have a descriptive legend. Legends should be typed together on a separate sheet, double-spaced. All illustrations should be in finished form ready for photoreproduction. A convenient size for drawings is $8\frac{1}{2} \times 11$ in. (21×27.5 cm). Drawings should be made with India ink on tracing linen, smooth surface white paper, or Bristol board. Graph paper if used should be ruled in blue. Grid lines that are to show in the final reproduction should be inked in black. Glossy prints properly prepared are acceptable.

Photographs must be kept to a minimum. All photographs should be submitted as single glossy prints with strong contrasts and not mounted on cardboard; the magnification should be indicated by a scale where possible. **Simple histograms should be avoided. A table or a paragraph in the text is preferred.**

Illustrations in color can be accepted only if the authors defray the cost.

Tables should be typed on separate pages, numbered consecutively with Arabic numerals in order of mention in the text. Each table should have a short explanatory title.

Authors may wish to submit complex tables as camera-ready copy. In this way, they are spared tedious proofreading and the chance of error is reduced. Tables submitted as camera-ready copy should be typed single-spaced whenever possible, and preferably submitted as 5×7 -in. glossy prints.

Footnotes should be designated in text by superscript numbers and typed on a separate sheet. Footnotes to tables should be identified with lowercase italic superscript letters and placed at the bottom of the table.

References to the literature should be cited in the text by Arabic numerals in parentheses and listed at the end of the paper in consecutive order. Abbreviations of journal titles should follow the style used in *Chemical Abstracts Service Source Index*, 1985. Please note style of capitalization and punctuation for journal articles and edited books in the following examples:

1. Jackson, G. E. D., and Young, N. M. (1987) *Anal. Biochem.* **162**, 251–256.
2. Bovey, F. A., and Jelinski, L. W. (1983) *Chain Structure and Conformation of Macromolecules*, p. 150, Academic Press, New York.
3. Britton, G. (1985) in *Methods in Enzymology* (Law, J. H., and Rilling, H. C., Eds.), Vol. 111, pp. 113–149, Academic Press, Orlando, FL.

Proofs. Proofs will be sent to the authors with reprint order forms. Fifty reprints of each article are provided free of charge. Additional reprints may be ordered using the form provided.